Carl Nicoladoni (1847–1902)

Professor of Surgery

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Carl Nicoladoni (1847–1902) studied medicine in Vienna and graduated in 1871. He became "Privatdozent" in surgery in 1876 and Professor of surgery in 1881. He accepted a chief position at the surgical clinics of Innsbruck (1881) and Graz (1895). His principal contributions are varied and numerous in many fields of surgery, ranging from orthopedic surgery and plastic and reconstructive surgery to urogenital surgery, gastrointestinal surgery, and even peripheral neurosurgery. Nicoladoni holds a singular position in orthopedic and reconstructive surgery as the first to effectively introduce the concept of transplanting a functioning muscle to substitute for the lost function of a paralyzed one. He developed a new technique of thumb reconstruction by a pedicled little finger to thumb transfer or a pedicled second toe to thumb transfer, hence the concept of toe to hand transfer was born. Nicoladoni performed the first bowel resection in an incarcerated gangrenous hernia followed by enteroraphy. Additionally, he introduced original ideas for enteroplasty and reported new operations for esophageal diverticulum and torsion of the spermatic cord. Nicoladoni was one of the first in literature who performed en bloc resection of the adrenal gland and the kidney due to carcinoma. Nicoladoni can be described as one of the most original surgeons of the modern time, and his achievements played a significant role in the march of modern surgery in Europe and far exceeded the boundaries of nineteenth century.

GERMAN-AUSTRIAN MEDICINE

Most of the advancements in medicine were made by the French up to and well beyond the year 1850. During the first half of the nineteenth century, German medicine was deeply influenced by the *"Naturphilosophie"* (Natural Philosophy) of Schelling (Konrad Schelling), which aimed to establish the subjective and objective identity of all things, and exerted a very baneful effect upon German medicine by diverting mental activity away from the investigation of concrete facts into realm of fanciful speculation.[1] This German medicine has been trenchantly described by Wunderlich (Carl Reinhold August Wunderlich 1815–77): "They had much industry and few results, they made many words and few observations, they created fantasies in profusion and philosophized very well."[2] Nevertheless, signs of new activity became apparent in Vienna during the first half of the nineteenth century. Four remarkable men, Carl Rokitansky (1804–1878), Josef Skoda (1805–1881), Ferdinand von Hebra (1816–1880), and Johannes von Oppolzor

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(1808–1871), became the nucleus of a group designated as the New Vienna School and raised Vienna once more to the position of a great medical center. The New Vienna School made many observations and initiated a new era in German medicine and in medical history.

The New Vienna School did not, like the Old Vienna School, disappear from the stage of medical progress with the death of its leaders. Rokitansky, Skoda, and Hebra did more than bring glory to the Vienna of their day. They left disciples who carried on their traditions of accuracy, industry, and honesty throughout the century. Among such representatives were von Dumreicher, Billroth, Toldt, Tandler, Zuckerkandl, Wenckebach, and von Pirquet. Other prominent members of the New Vienna School were Josef Hyrtl, the great anatomist; the physiologist Ernst von Brücke; the ophthalmologists Beer, Arlt, Stellwag von Carion, and Jaeger von Jaxtthal; Adam Politzer, the otologist; the clinicians Bamberger, Winternitz, and Nothnagel; and the neurologists Meynert, Benedikt, and Ritter von Rittershain. It was largely due to the eminently practical tendency of these physicians of the New Vienna School that German medicine finally crossed the Rubicon.[2]

THE INFLUENCE OF GERMAN AND AUSTRIAN MEDICINE ON AMERICA

In the second half of the nineteenth century, the universities of Germany, Austria, and Switzerland not only exerted a great influence on European medicine but also on American medicine. "Universities of Germany" wrote Osler in 1890, "are her chief glory, and the greatest boon they can give us in the New World is to return our young men infected with the spirit of earnestness and with the love of thoroughness which characterizes the work done in them." Many young American physicians went to Germany and Austria for their further education and on their return home brought with them the spirit of earnestness and thoroughness that Osler had praised. The reputation of the New Vienna School drew pupils from all over the Europe and the New World. In the latter half of the nineteenth century, Vienna became the Mecca of young American doctors studying abroad, just as Paris once had been. American medical students came to Vienna in such numbers that they founded the American Medical Association of Vienna.[2]

In the period which may date from 1865 to 1910, American medicine, particularly surgery, began rapidly to mature. This period, when Langenbeck, Billroth, and Kocher reigned supreme in Europe and when Virchow established cellular pathology, saw the dominant influence of the German school on American surgery. Numerous American scientists, clinicians, and surgeons who went to Berlin, Vienna, Leipzig, and Bern for their postgraduate instruction contributed to the rise of American medicine.[3] Henry Pickering Bowditch (1840–1911), after study with Claude Bernard (1814–1878) in Paris and with Carl Ludwig (1816–1895) in Leipzig, returned to Boston and established at Harvard in 1871 the first well-equipped laboratory of physiology in America. After 2 years' study in Vienna with Rokitansky and Skoda and Virchow in Berlin, Reginald Fitz (1843–1913) returned to Boston and became professor of pathology at Harvard. Later, turning to clinical medicine, he became one of the outstanding physicians of his time. In 1866, he pointed out the importance of diseases of the appendix.[2]

Nowhere, however, was the deep impress of German medicine felt so strongly as at the new school of medicine that arose in Baltimore during the closing years of the nineteenth century. The establishment of the Johns Hopkins medical school marks the beginning of a new era in American medicine. Four remarkable doctors: William H. Welch (1850–1934), William Osler (1849–1920), William Stewart Halsted (1852–1922), and Howard Atwood Kelly (1858–1943) made notable contributions to the progress of the new hospital and medical school as well as to American medicine.[2]

Welch, who had received his doctor's degree from the College of Physicians and Surgeons of New York in 1875, spent nearly 2 years in Germany working with Hoppe-Seyler, Waldeyer, and von Recklinghausen in Strassburg; with Wagner and Ludwig in Leipzig; and with Cohnheim in Breslau. In 1884, he was appointed professor of pathology in the new Johns Hopkins University.

William Osler received his medical degree in 1872 after 2 years' postgraduate study in London, Berlin, Leipzig and Vienna. In 1889, he was called to Baltimore as professor of medicine in the newly founded Johns Hopkins Medical School. At Johns Hopkins, he introduced a combination of the English and German methods of medical teaching, which made his clinic the outstanding one of his period on the American continent and a model widely imitated.

William Stewart Halsted, a native of New York, graduated at the New York College of Physicians and Surgeons in 1877 and, after 2 years of study abroad, working mostly in Billroth's clinic in Vienna but also with von Bergmann in Würzburg and in Leipzig and Halle, returned to New York, where he soon acquired an active surgical practice.

The fourth of the doctors, Howard Atwood Kelly who spent some time for his surgical training in Germany after his graduation at the University of Pennsylvania, was only 31 years of age at the time of his appointment as professor of gynecology and obstetrics in Johns Hopkins.

When the medical school was opened in 1893, other promising young men such as Franklin Paine Mall (1862–1917) age 31, a graduate of Michigan, who had worked in Leipzig with the anatomist Wilhelm His (1831–1904) and physiologist Ludwig, was appointed professor of anatomy.

In 1893, John J. Abel (1857–1938), a native of Ohio, who had spent 7 years abroad studying at the universities of

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Leipzig, Strassburg, Heidelberg, Vienna, Bern, Würzburg, and Berlin was appointed the first professor of pharmacology in the new medical school of Johns Hopkins University. He was quite active in encouraging the establishment of American scientific journals and acted as godfather to a number of journals.[2]

Harvey Cushing (1869–1939), the outstanding neurologic surgeon and pupil of Halsted, was associated with Johns Hopkins from 1896 until 1911. Early in his career, he worked with Kronecker and Kocher in Bern. John Howland (1873–1926), after serving an internship, he spent a year studying in Berlin and Vienna. In 1910, he spent a year with Czerny at Strassburg. In 1912, he was called to Johns Hopkins as professor of pediatrics.[4]

Under the strong influence of the German School, the Johns Hopkins group contributed to the advancement of scientific medicine by their medical achievements. The medical school had a potent influence in elevating the standards of medical education. The Johns Hopkins Hospital with its system of medical, surgical, gynecologic, and obstetrical residencies, introduced a new era in professional training in America.[2]

American doctors such as John B. Murphy (1857–1916) of Wisconsin, Georg Washington Crile (1864–1943) of Cleveland, Frederic Shepard Dennis (1850–1934) of Newark, and Albert John Ochsner (1858–1925) of Chicago, who had some training in German and Austrian clinics, are also noteworthy.[3] John B. Murphy, the most brilliant surgeon of his time in the Mid-West, was professor of surgery at Northwestern University from 1895 to 1916. Murphy spent 2 years in postgraduate study at the clinics of Vienna. Georg W. Crile of Ohio made fruitful contributions of permanent value to surgery. He spent various periods of time in research at Vienna. He was professor of clinical surgery at the Western Reserve University. Dennis, a graduate of Yale, later studied at Heidelberg, Berlin, and Vienna, became professor of surgery at Bellevue Hospital Medical College. He is known for his surgical work on the head and the osseous system. Albert J. Ochsner, a native of Baraboo, Wisconsin, graduated at Rush Medical College in 1886, and after postgraduate study in Vienna and Berlin, began practice in Chicago.

INTERNATIONAL TRAINEES

Many international trainees in various fields received some training or medical education in German, Austrian, and Swiss clinics. Among those, Thomas Lauder Brunton (1844–1916) from Scotland, Alfred Herbert Tubby (1865–1936), Lord Berkeley George, Sir Harold Jalland Stiles (1863–?), and Joseph Payne (1840–1910) from England; Antonio Carle (1854–1927) from Italy; Nikolai Ivanovich Pirogoff (1810–1881), Ivan Petrovic Pavlov (1849–1936), and Hermann Senator (1834–1911) from Russia; Emanuel Fredrik H. Winge (1827–1894) from Norway; and Shibasaburo Kitasato (1852–1931) from Japan are worth mentioning.[3]

SURGERY IN GERMAN-SPEAKING COUNTRIES

The practice of surgery toward the end of the century acquired the confidence of the public even to a greater degree than was held by other branches of medicine. No longer was the art practiced by empiricists and barbers, as in the eighteenth century, but by illustrious surgeons who had carefully studied anatomy and pathology before taking up surgery. The study and practice of surgery has been expanded and advanced especially following the fundamental discoveries of anesthesia by Morton and Long (1846) and asepsis by Lister (1867).[1,5]

Particularly in the second half of the nineteenth century, surgery attained notable successes by the pioneering roles of outstanding surgeons in German-speaking countries, such as von Gräfe (1787–1840), Dieffenbach (1792–1847), von Langenbeck (1810–1887), Kocher (1841–1917), von Bergmann (1836–1907), von Eiselsberg (1860–1939), König (1832–1910), and the surgeons of the Viennese school of von Dumreicher (1815–1880), Billroth (1829–1894), Czerny (1842–1916), von Mikulicz (1850–1905), Albert (1841–1909), Lorenz (1854–1946), and Nicoladoni (1847–1902). Among the many eminent surgeons who contributed significantly to the rise of modern surgery in the nineteenth century, was Carl Nicoladoni who was trained under the supervision of von Dumreicher in the first university clinic of surgery at *"Allgemeines Krankenhaus"* in Vienna. Carl Nicoladoni later was appointed to succeed him. He pursued his career as Professor of Surgery and became chief at the surgical clinics of Innsbruck and Graz. His principal contributions are varied and numerous in many fields of surgery, although he is famous for his work on tendon transfers and tendon sutures and for his pioneering of pollicization of a toe. He reported new operations for esophageal diverticulum, torsion of the spermatic cord, and resections in gangrenous hernia.

This historical article introduces Carl Nicoladoni and reviews his role in the pageant of surgery based on a thorough investigation of his life and scientific publications. Several unique examples extracted from his original articles represent his significant contributions to the surgical progress during the nineteenth century.

BIOGRAPHY OF NICOLADONI

Nicoladoni's parents moved from Lago Maggiore in Italy to Vienna in Maria Theresian times. Carl Nicoladoni was born on April 23, 1847, in Vienna. He studied medicine in Vienna and graduated in 1871. As a student, he was considerably interested in anatomy and was influenced by the famous anatomist, Joseph Hyrtl (1810–1894)[6,7] of the New Vienna School. Nicoladoni also studied and collaborated with

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the other famous teachers of the New Vienna School, among them were Oppolzer, Rokitansky, Skoda.

In 1872, Nicoladoni joined the first surgical university clinic of the General Hospital *"Allgemeines Krankenhaus"* in Vienna. The chief of the clinic was Johann von Dumreicher (1815–1880), who had a great impact on Nicoladoni's surgical career. When Eduard Albert (1841–1909),[8] a member of von Dumreicher's team, accepted a chair at the surgical clinic of Innsbruck in 1872, Nicoladoni became chief assistant in von Dumreicher's clinic. Under the mentorship of von Dumreicher, he was heavily involved in surgical practice, and thus was able to gain experience and increase his surgical skillfulness. Apart from his clinical work, he dedicated much of his time to teaching and scientific research. In 1876, Nicoladoni became a Privatdozent of surgery in Vienna.[9]

The continuing success of the neighboring second surgical clinic in Vienna under Theodor Billroth (1829–1894), the father of gastrointestinal surgery, did not fail to have an influence on Nicoladoni. Nicoladoni was able to witness many of the new developments in Billroth's clinic. However, he never gave up his loyalty to his old teacher, von Dumreicher, who represented the old surgical approach.

In the year 1880, Nicoladoni replaced his chief, von Dumreicher, due to his illness. The death of his surgical mentor was a turning point in Nicoladoni's academic career. When Eduard Albert,[8] a pioneer of orthopedic surgery and teacher to the famous Adolf Lorenz (1854–1946), accepted a chief position and became successor of von Dumreicher in Vienna, Nicoladoni replaced Albert in Innsbruck and became professor of surgery in 1881 (Fig. 1).

Eduard Albert who was in the commission *Berufungskommision*, responsible for recruitment in hospital, proposed Nicoladoni, a 34-year-old surgeon, as a candidate for the chief of the general surgical unit of Innsbruck. In his 25-page proposal manuscript, he wrote about the difficulties and problems of electing the new chief for the surgery. There was a tremendous amount of competition for this position. Among those candidates, Czerny (Vincenz Czerny 1842–1916), of Trautenau, Bohemias, who became a professor of surgery at Freiburg in 1871, was strongly supported by his mentor, Billroth. However, against Billroth's preference, who wanted his own student, Czerny, to be elected, Nicoladoni, as a competent and skillful surgeon with a broad spectrum of knowledge in surgery and experience, was preferred. Apparently, in addition to his general savvy, Nicoladoni owing to his Italian descent was also able to speak Italian, which made him international and more acceptable for this position.[10]

Nicoladoni stayed in Innsbruck for almost fourteen and a half years. During that time he attained several administrative roles in the management of the surgical clinic and performed numerous innovative surgical procedures including the reconstruction of a thumb using a tubed pedicle flap from thorax (1891). Between years 1885 and 1888, Nicoladoni also worked for the establishment of a new hospital building in Innsbruck (Fig. 2).

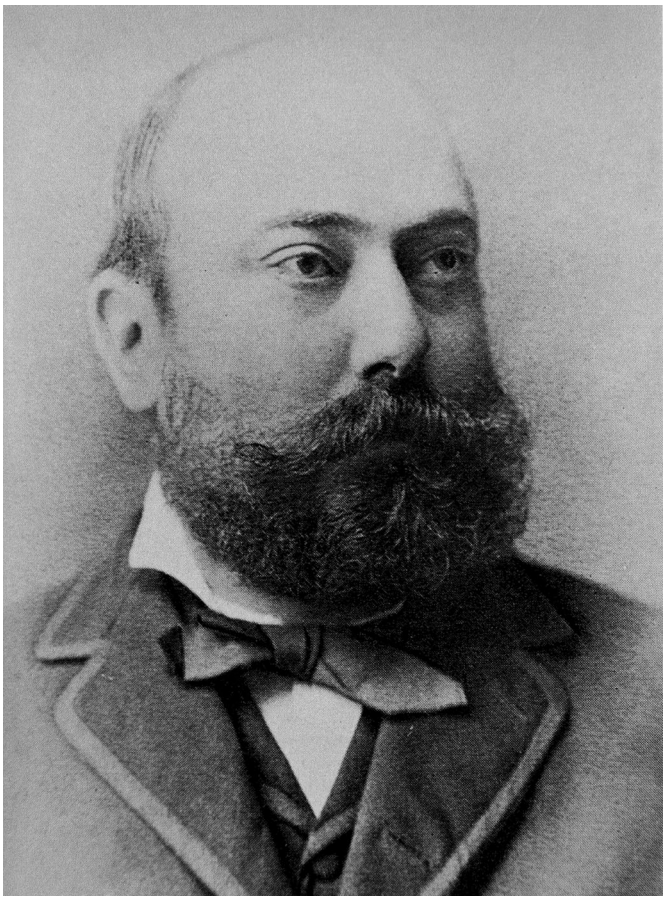

FIGURE 1. Carl Nicoladoni, Professor of Surgery (Reprinted from the book; Huter F. Forschungen zur Innsbrucker Universitätsgeschichte. 2. Teil, Hundert Jahre Medizinische Fakultät Innsbruck 1869 bis 1969. Herausgeber, Universität Innsbruck; 1969).

He is also remembered for his famous speech at the official opening of the new hospital in Innsbruck. Additionally, Nicoladoni was helpful for the development of the department of ear-nose-throat at the surgical clinic. He served as the "Dean" in 1883–4, a position that was only reserved at that time for preclinical professors. During the period of 1887–8, Nicoladoni was also the first clinician in the history of medical faculty to become the "Rector" of the medical faculty at the University of Innsbruck.[11]

Nicoladoni accepted a chief position at the surgical clinic in Graz in 1895 after rejecting an invitation to the surgical clinic in Prague. The Styrian capital offered a much broader clinical spectrum and better academic aids to develop a prospering medical school. Unfortunately Nicoladoni's state of health started to decline after a serious attack of influenza. Nicoladoni stayed for 7 years in Graz and died of

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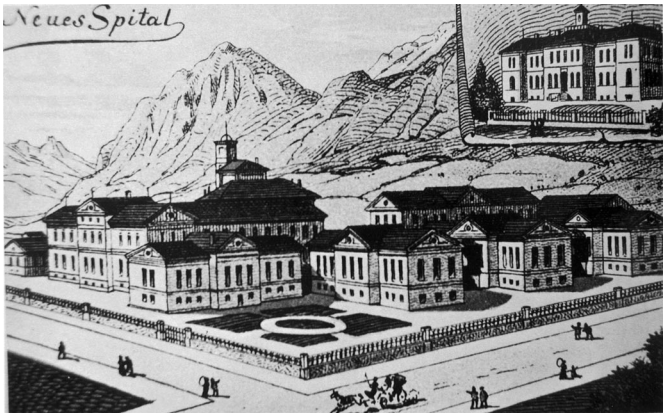

FIGURE 2. The new hospital building in Innsbruck, (Reprinted from the book; Huter F. Forschungen zur Innsbrucker Universitätsgeschichte. 1. Teil, Hundert Jahre Medizinische Fakultät Innsbruck 1869 bis 1969. Herausgeber, Universität Innsbruck; 1969).

a sudden heart attack in the night from the 3rd to the 4th of December 1902, at the age of 55 years[9] (Table 1).

Nicoladoni also trained many well-known surgeons, such as Erwin Payr,[10,12] Emanuel Finotti,[13] Josef Hertle,[14] Arnold Wittek,[10,15] Hans von Haberer,[10] Josef Lippburger,[16] and Georg Juffinger[17] (Table 2). Among them, Erwin Payr[12] who became Professor of Surgery at Graz, and chief of surgery in Greifswald, Königsberg, and then at Leipzig in 1911, was an excellent surgeon, making contributions to many surgical subjects, particularly on disease of the joints, surgery of the abdominal organs, breast, and thyroid gland.

NICOLADONI AND SURGERY

Nicoladoni's pupil, Erwin Payr writes in an article about his tutor, Nicoladoni, as follows: ". . . The manner Nicoladoni operated was always original. Whether he was performing a reconstructive or plastic surgery for correction of a deformity, every time something new came out. His operations were very clearly organized and performed. Nicoladoni was an artist in the operation room, who could make the most technical difficulties easy. His exact knowledge of topographic anatomy made it possible to operate with the absolute safety. Nicoladoni was living in his own empire so called: The clinic-lectureship-science. . . . Nicoladoni can be described as one of the most original surgeons of the modern time. . . "[9]

TABLE 1. Short Biography of Carl Nicoladoni (1847–1902)

Date	Chronological Events
1847	Born in Vienna
1871	Graduated medicine in Vienna
1872–1876	Trained under supervision of von Dumreicher in the first surgical clinic of "*Allgemeines Krankenhaus*" in Vienna
1876	Became Privatdozent
1880	Replaced his chief, von Dumreicher
1881	Became Professor of surgery, and chief of surgical clinic in Innsbruck
1883–1884	"Dean" of the medical faculty in Innsbruck
1887–1888	"Rector" of the medical faculty in Innsbruck
1895	Became chief of surgical clinic in Graz
1902	Died at the age of 55 years, in Graz

According to Billroth, the father of gastrointestinal surgery, Nicoladoni, through imperishable deeds of his mind and skillful hand, belonged to those industrious personalities, who were responsible for the rise of modern German surgery.[9]

Nicoladoni progressed rapidly in his surgical career owing to his overall interest in clinical anatomy. He had pioneering ideas in a variety of surgical fields. His ability ranged from general visceral surgery, orthopedic surgery, urogenital surgery to plastic and reconstructive surgery, and even peripheral neurosurgery.

Nicoladoni's contributions in the field of orthopedic surgery are numerous and varied, including his detailed studies on the anatomy and biomechanics of scoliosis and operations for treatment of various orthopedic conditions and tendon transfers. He operated for the treatment of pseudoarthrosis,[18] old luxations,[19] traumatic cubitus varus deformity,[20] toe contractures,[21] toe fractures,[22] and femur fractures.[23] Additionally, he investigated myositis ossificans progressiva.[24]

Nicoladoni gave a detailed classification and descriptions of several foot deformities and their operative treatment, such as pes calcaneus,[25–27] pes equinus paralyticus,[28] flat foot,[29] and hammer-toe deformities.[30]

In particular, he described the pes calcaneus deformity in considerable detail and gave its original operative treatment for the first time in literature. Nicoladoni was deeply concerned about achieving a well-balanced antigravity stability on the feet. His ideas on describing and treating pes calcaneus deformity clinically were preceded with animal experiments. In a rabbit model, he described the changes of the calcaneus bone and the development of pes calcaneus deformity with a high arch. For the treatment of traumatic pes calcaneus deformity after rupture of the Achilles tendon, Nicoladoni suggested that the direct suture of the Achilles tendon can be considered based on the publication of Annandale in Lancet, 1877. However, he developed his own technique for treating traumatic pes calcaneus deformity as summarized in the following manner: ". . .A 12 cm skin incision was performed on the lateral aspect of the lower leg extending to the lateral border of the ankle joint. Another incision perpendicular to the previous one 6 cm in length was carried

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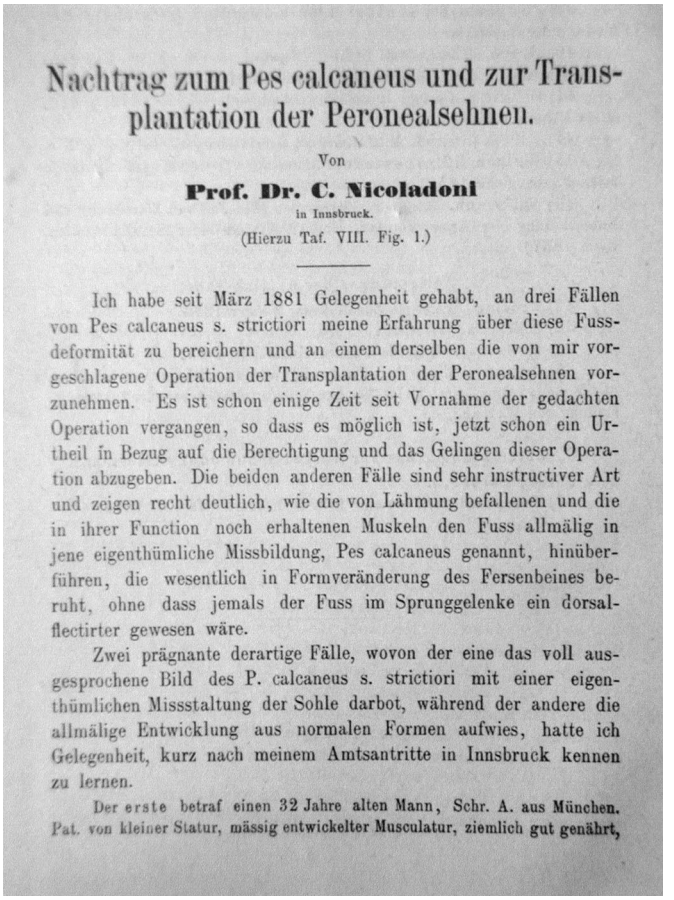
TABLE 2. Trainees of Carl Nicoladoni Throughout His Surgical Career

Erwin Payr (1871–1946)	Worked with Nicoladoni in Graz between 1898–1902 and became professor of surgery at Graz in 1899, became chief in Greifswald (1907–1910), in Königsberg (1910–1911), and then at Leipzig (1911–1936).
Emanuel Finotti (1864–1897)	Worked with Nicoladoni as a surgical resident and substituted Nikoladoni in his illness in Innsbruck.
Josef Hertle (1871–?)	Between 1900–1902 worked as a surgical resident with Nicoladoni in Graz.
Arnold Wittek (1871–1956)	Worked as a surgical resident with Nicoladoni in Graz between 1896–1902, became president of German Society of orthopedics and orthopedic surgery in 1924.
Hans von Haberer (1875–1959)	Worked with Nicoladoni in Graz between 1900–1902, became chief of the surgery at Innsbruck in 1911 and later "Dean" of the medical faculty (1920/1921). He became chief of the surgery in 1924 at Graz and in 1926 at Düsseldorf and in 1930 at Köln, Germany.
Josef Lippburger (?-1923)	Worked with Nicoladoni in Innsbruck between 1886–1895, became chief of surgery in Vorarlberg.
Georg Juffinger (1853-?)	Worked with Nicoladoni in Innsbruck between 1881–1884, became docent of Otorhinolaryngology at the University Clinic, Innsbruck in 1895.

out over the Achilles tendon. The distal and proximal ends of the tendon were dissected and prepared. Next the peroneus tendon was detached from the bony insertion distally and dissected free from surrounding muscles. But the whole synovium of the tendon was left intact. Then, the peroneus tendon was pulled down and stitched to the distal end of the Achilles tendon or the calcaneus bone depending on the location of the lesion. The proximal stump of Achilles tendon was divided longitudinally into 2 parts (12 cm each), which were then stitched around the peroneus tendon . . . "[27] (Fig. 3). Nicoladoni successfully used this method followed by application of an ankle cast in an additional 2 cases that subsequently regained normal function as documented by his colleague, Eduard Albert.

Thus, among his numerous achievements, Nicoladoni holds a singular position in orthopedic and reconstructive surgery as the first to effectively introduce the concept of transplanting a functioning muscle to substitute for the lost function of a paralyzed one.[27,31,32] Nicoladoni declared his original idea of transplanting the tendon of a healthy muscle to substitute for the lost function of a paralyzed muscle in a scientific meeting *"Versammlung deutscher Aerzte und Naturforscher in Salzburg"* in 1881.[31] During the same meeting he demonstrated the performance of a case of traumatic pes calcaneus with a great success.

However, Nicoladoni's impact on the Vienna School and rise of orthopedic surgery far exceeded this one innovative contribution. His paper on the operative treatment of pes equinus paralyticus is also noteworthy.[28] He treated 3 cases with severe pes equinus paralyticus by performing arthrodesis of the ankle joint. Here we quote representative sections from this original paper on the treatment of severe pes equinus paralyticus. ". . .There is a case of severe pes equinus in the collection of the surgical clinic of Professor Albert in Vienna in which the posterior surface of the tibia forms a pseudoarticulation with the deformed flattened surface of the posterior process of the calcaneus. It is obvious that such a pes equinus could not be reduced by tenotomy. A further factor in fixed pes equinus may lie in the disparity between a narrow intramalleolar space and the width of the body of the ta-



Nachtrag zum Pes calcaneus und zur Transplantation der Peronealsehnen.

Von

Prof. Dr. C. Nicoladoni

in Innsbruck.

(Hierzu Taf. VIII. Fig. 1.)

Ich habe seit März 1881 Gelegenheit gehabt, an drei Fällen von Pes calcaneus s. strictiori meine Erfahrung über diese Fussdeformität zu bereichern und an einem derselben die von mir vorgeschlagene Operation der Transplantation der Peronealsehnen vorzunehmen. Es ist schon einige Zeit seit Vornahme der gedachten Operation vergangen, so dass es möglich ist, jetzt schon ein Urtheil in Bezug auf die Berechtigung und das Gelingen dieser Operation abzugeben. Die beiden anderen Fälle sind sehr instructiver Art und zeigen recht deutlich, wie die von Lähmung befallenen und die in ihrer Function noch erhaltenen Muskeln den Fuss allmälig in jene eigenthümliche Missbildung, Pes calcaneus genannt, hinüberführen, die wesentlich in Formveränderung des Fersenbeines beruht, ohne dass jemals der Fuss im Sprunggelenke ein dorsalflectirter gewesen wäre.

Zwei prägnante derartige Fälle, wovon der eine das voll ausgesprochene Bild des P. calcaneus s. strictiori mit einer eigenthümlichen Missstaltung der Sohle darbot, während der andere die allmälige Entwicklung aus normalen Formen aufwies, hatte ich Gelegenheit, kurz nach meinem Amtsantritte in Innsbruck kennen zu lernen.

Der erste betraf einen 32 Jahre alten Mann, Schr. A. aus München. Pat. von kleiner Statur, mässig entwickelter Musculatur, ziemlich gut genährt,

FIGURE 3. The title page of Nicoladoni's paper entitled as "Nachtrag zum pes calcaneus und zur Transplantation der Peronealsehnen" (Addendum on pes calcaneus and transplantation of peroneus tendon).

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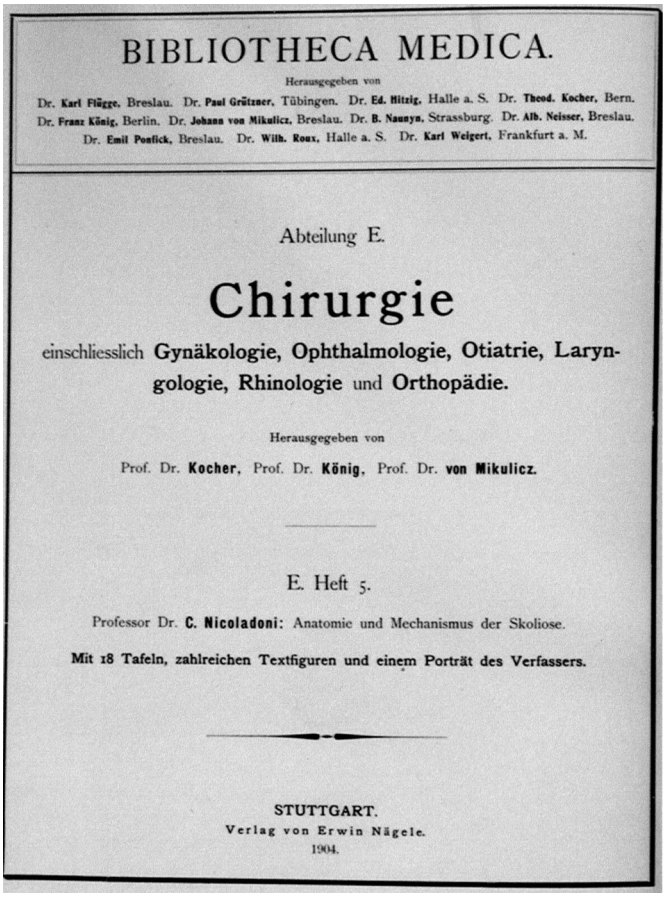
lus. . . . It is clear that to relieve this form of pes equinus one must undertake operations on the bone itself. . . ."[28,33] Nicoladoni was in collaboration with other notable surgeons of that time such as Anton Wölfler and Theodor Billroth, who suggested supramalleolar osteotomy for the correction of a fixed pes equinus. Nicoladoni suggested that if correction of the position of the foot to a status quo ante was attained by tenotomy, such correction would require a plantar flexion checking brace that would offer only a relatively brief period of resistance to the deformity which gradually would recur. Due to the tendency for recurrence and due to the inability of constructing a suitable brace (because of local circumstances) in the Tyrol region at that time, he developed a new idea for treating such cases permanently. He was inspired by Albert's idea of arthrodesing a knee joint, which demonstrated that in total paralysis of a limb, in which even trophic nerves were paralyzed, a bony fusion of the knee permitted ambulation. Following this concept, Nicoladoni attempted to ankylose the ankle joint in 2 cases with pes equinus paralyticus so that after its fusion the use of a brace remained superfluous. Briefly his innovative surgical technique of ankle joint arthrodesis for severe cases of pes equinus paralyticus was described in the following section: ". . . A longitudinal incision was made over the dorsum of the ankle joint to the fascia. This was divided between the extensor hallucis and extensor digitorum longus. Both muscles were separated. The anterior tibial artery and the deep peroneal nerve were retracted medially. The joint capsule was opened and separated from the anterior border of the tibia. The articular cartilage of the superior surface of the talus and of the tibia was removed with a short strong resection knife. Enough bone was removed from the articular surface of the fibula to permit replacement of the body of the talus between the malleoli. The talus and the tibia were bound by 2 strong silver wire sutures . . . 6 months after the surgery, his foot was placed at a right angle to the tibia; the ankle joint was fused and immobile, the plantar flexion was completely eliminated. . . ."[33]

Nicoladoni is considered one of the most original surgeons of his time, with a particular interest in clinical anatomy. He has made significant contributions in the field of scoliosis based on detailed anatomic and kinetic investigation. His commitment to the research of scoliosis resulted in 3 books and 3 bigger treatises (in German) with many original figures and photographs, most of which were prepared and even drawn by him. His earliest book was printed in 1882 and was on the torsion of the scoliotic spine, "*Die Torsion der skoliotischen Wirbelsäule"*.[34] Three bigger treatises on scoliosis entitled *"Die Architektur der skoliotischen Wirbelsäule"* (The Architecture of the Scoliotic Spine, 1889),[35] *"Die Architektur der kindlichen Skoliose"* (The Architecture of Juvenile Scoliosis, 1894),[36] and *"Die Skoliose des Lendensegmentes"* (The Scoliosis of Lumbar Segments, 1894)[37] were published in an anthology called "*Denkschriften der Kaiserlichen Akademie der Wissenschaften,*" a series of publications from the imperial academy of science. Two versions of his epical work *"Anatomie und Mechanismus der Skoliose"* (Anatomy and Mechanism of Scoliosis) were printed. A larger edition printed in 1904 was part of the *"Bibliotheca Medica,"* a monumental series of various clinical books published around the beginning of the last century[38] (Fig. 4). Theodor Kocher (1841–1917) from Bern, Johann von Mikulicz (1850–1905) from Breslau, and Wilhelm Roux (1850–1924) from Halle were among the most prominent editors of this series of books. The second version, a shortened one, having the same title was included in an anthology called "*Deutsche Chirurgie*" (German Surgery) and published in 1909.[39] Examination of his books revealed that Nicoladoni described precisely the mechanism and the architecture of adult as well as juvenile scoliosis, based on his thorough anatomic studies.



BIBLIOTHECA MEDICA.

Herausgegeben von

Dr. **Karl Flügge**, Breslau. Dr. **Paul Grützner**, Tübingen. Dr. **Ed. Hitzig**, Halle a. S. Dr. **Theod. Kocher**, Bern. Dr. **Franz König**, Berlin. Dr. **Johann von Mikulicz**, Breslau. Dr. **B. Naunyn**, Strassburg. Dr. **Alb. Neisser**, Breslau. Dr. **Emil Ponfick**, Breslau. Dr. **Wilh. Roux**, Halle a. S. Dr. **Karl Weigert**, Frankfurt a. M.

Abteilung E.

Chirurgie

einschliesslich **Gynäkologie, Ophthalmologie, Otiatrie, Laryngologie, Rhinologie** und **Orthopädie.**

Herausgegeben von

Prof. Dr. **Kocher**, Prof. Dr. **König**, Prof. Dr. **von Mikulicz.**

E. Heft 5.

Professor Dr. **C. Nicoladoni:** Anatomie und Mechanismus der Skoliose.

Mit 18 Tafeln, zahlreichen Textfiguren und einem Porträt des Verfassers.

STUTTGART.
Verlag von Erwin Nägele.
1904.

FIGURE 4. The title page of the *"Bibliotheca Medica"* a monumental series of various clinical books, in which Nicoladoni's *"Anatomie und Mechanismus der Skoliose"* (Anatomy and Mechanism of Scoliosis) was printed in 1904.

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Nicoladoni introduced original ideas in reconstructive hand surgery.[40–43] He carried out the first thumb reconstruction in Innsbruck in 1891, which was published in 1897.[40] He showed that a thumb that had lost the entire skin coverage through degloving injury could be retained into a thoracic skin flap prepared into the shape of a glove. Then, the pedicle was divided 3 weeks after the initial surgery and in this way the thumb defect was successfully covered. He had also an idea of substituting the bony defects with a segment of tibia of proper thickness and length in the newly reconstructed skin-thumb glove. However, to avoid a second stage of bone grafting, Nicoladoni developed a new technique of thumb reconstruction by a pedicled little finger to thumb transfer or a pedicled second toe to thumb transfer. The latter seemed an ideal substitute and the concept of toe to hand transfer was born, which spread throughout many countries. We quote here the following lines that illustrate his inventive surgical technique of toe to thumb transfer: ". . .With a large dorsal four-cornered flap, the metatarsophalangeal link of the second toe should be exposed and opened after cutting through the dorsal tendons . . . To the thoroughly prepared thumb stump wound, the tendon of the flexor thumb is first united with the volar tendons of the toe and then the I phalanx stump of the thumb with the base of the proximal phalanx of the toe using a catgut bone suture. Then the dorsal tendons are brought together, and finally the large dorsal flap is combined with the dorsum of the thumb stump so that a wide joint of the same is secured to the dorsal stump. A splint is applied at this point and the placement and layering of the 2 extremities by the gypsum-bandage secured. The remaining volar flap of the second toe provides the nourishment of the organic combination of the toe and thumb. The second toe is separated by the building of a three-cornered cusp after restoration of normal color shows that permanence of the artificial new circulation has been established. Thereby, the second toe becomes self-supporting in its new position. . . ."[41,42]

Nicoladoni was described by his pupil, Erwin Payr, as a master of plastic *"Meister of Plastik."*[9] Although in plastic surgery Nicoladoni is remembered for his pioneering role in the toe to hand transfer, he successfully performed other types of plastic and reconstructive surgery.[44] He operated on a soldier severely wounded in a battle field, during which Nicoladoni reconstructed the nose with a forehead flap and bone graft. In the same patient he performed lip, eyelid reconstructions and columella reconstruction using 2 distally based flaps from upper lip, followed by several scar revisions thereafter. He was also so advanced in reconstructive surgery that Professor von Hebra sent him a case that had a nasal tip defect. In another case with stenosis of nostrils, after freeing the stenosis he transposed a flap from upper lip and used a stent for several months to prevent recurrence.

Nr. 28. Sonntag den 9. Juli 1882. XXIII. Jahrgang.

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INHALT: **Originalien und klinische Vorlesungen.** Beiträge zur Nervenchirurgie. Von Prof. Dr. C. Nicoladoni in Innsbruck. (Fortsetzung.) Noch einmal die Totalexstirpation des karzinomatösen Uterus. Von Prof. Dr. Karl v. Rokitansky, Direktor des Maria Theresia-Frauenhospitals in Wien. — Zur Technik der Dilatation bei Larynxstenosen. Von Dr. Theodor Hering in Warschau. — **Berichte aus Kliniken und Spitälern.** Aus der Klinik des Geh. Medizinalrathes Prof. Dr. Leyden in Berlin. Zur Lehre von der Wirkung grosser Digitalisdosen im Zeitraum der wiederholten Kompensationsstörung bei Herzklappenfehlern. Dr. A. Fraenkel, Assistent der propädeutischen Klinik und Dozent an der Universität. (Schluss.) — **Medizinal-Gesetzgebung und öffentliche Gesundheitspflege.** Die nächsten Aufgaben der österreichischen Sanitätsgesetzgebung. (Fortsetzung.) — Ein Wort über den Geist und Körper beim Unterrichte. Von Dr. L. Günzburg in Wien. — **Verhandlungen ärztlicher Gesellschaften und Vereine.** XI. Kongress der deutschen Gesellschaft für Chirurgie zu Berlin. Originalbericht der „Wiener Med. Presse". (Schluss.) — **Kritische Besprechungen und literarische Anzeigen.** Transactions of the American Gynecological Society. Angezeigt von Prof. Dr. Ludwig Kleinwächter, d. Z. in Prag. (Fortsetzung.) — Die Grundsätze der Thermochemie und ihre Bedeutung für die theoretische Chemie. Von Dr. Hans Jahn in Wien. — **Standes-Angelegenheiten, Tagesgeschichte und Korrespondenz.** Bemerkungen über die öffentliche Gesundheitspflege in den okkupirten Provinzen. Von Dr. Leopold Glück, Distriktsarzt in Prnjavor (Bosnien.) Aerztliche Honorargeschichten aus alter und neuer Zeit. Von Moriz Wertner. — **Kleine Chronik.** — Offene Korrespondenz der Redaktion und Administration. — **Anzeigen.**

Originalien und klinische Vorlesungen.

Beiträge zur Nervenchirurgie.

Von

Prof. Dr. C. Nicoladoni

in Innsbruck.

(Fortsetzung.*)

II. Dehnung des N. ulnaris.

Nachfolgende Beobachtung erscheint bemerkenswerth durch einen Operationszwischenfall, der durchaus nicht beabsichtigt,

Oktober 1880 kam Pat. mit heftigen neuralgischen Anfällen im Bereiche des linken N. ulnaris wieder zur Aufnahme. Es wurden die in der Nähe des N. ulnaris gelegenen Narben excidirt und rasche Primaheilung angestrebt und erreicht. Die Schmerzen besserten sich wohl, schwanden aber nicht gänzlich.

Im Juli 1881 kehrte sie wieder mit der Angabe, dass bei ganz leichter Beschäftigung, wie z. B. stricken, die heftigsten Schmerzen in der linken Extremität auftreten, die besonders in den letzten zwei Fingern wüthende seien.

Am 16. Juli 1881 wurden die Weichtheile von der inneren Seite des ankylotischen und mit vielen zackigen

FIGURE 5. The title page of Nicoladoni's paper on the ulnar nerve compression in Wiener Medizinische Presse published in 1882.

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Nicoladoni also performed nerve surgeries in an attempt to treat neuralgia and compression neuropathies.[45] Experimentally, he investigated the nerve endings of the knee joint in a rabbit model.[46] He performed resection of the 4th intercostal nerve in one case and resection of the mandibular nerve in another for treating long-term neuralgia.[47] He additionally investigated the relationship between scoliosis and sciatic nerve compression and described the signs and symptoms of this condition.[48,49] He described operations for treating compression of the accessory nerve, the radial nerve, the axillary nerve, and the ulnar nerve. We quote here his original description in a patient with ulnar nerve compression: ". . .In a 23-year-old patient, who had suffered from ankylosis of elbow joint after chronic inflammation at the age of 8 years, a correction was done by Prof. Albert (resection of the lower humerus epiphysis). After that operation heavy neurologic complaints on the ulnar aspect of the hand developed. First a resection of the soft tissue scar was successfully performed. But one year later the neurologic symptoms came back. . ." Nicoladoni describes his operation in the following section: ". . .I carefully tried to dissect the nerve free from the hard scar tissue and resected the osteophyte. After the ulnar nerve was exposed, it was followed proximally and distally a few centimeters. Sensation in the lateral aspect of the fourth finger and the fifth finger improved to normal one and a half months after the operation. The patient was able to move the fingers very well, and the power of grasp was comparable to the other side. The neurologic symptoms disappeared totally. . . ."[50] (Fig. 5).

When Nicoladoni was appointed to the first university clinic of surgery in Vienna under the mentorship of von Dumreicher in 1872, Billroth was head of the department of the second surgical clinic. Nicoladoni was also greatly influenced by the new developments of this neighboring surgical clinic. He was instrumental in the development of the first gastroenterostomy, which was carried out by Anton Wölfler

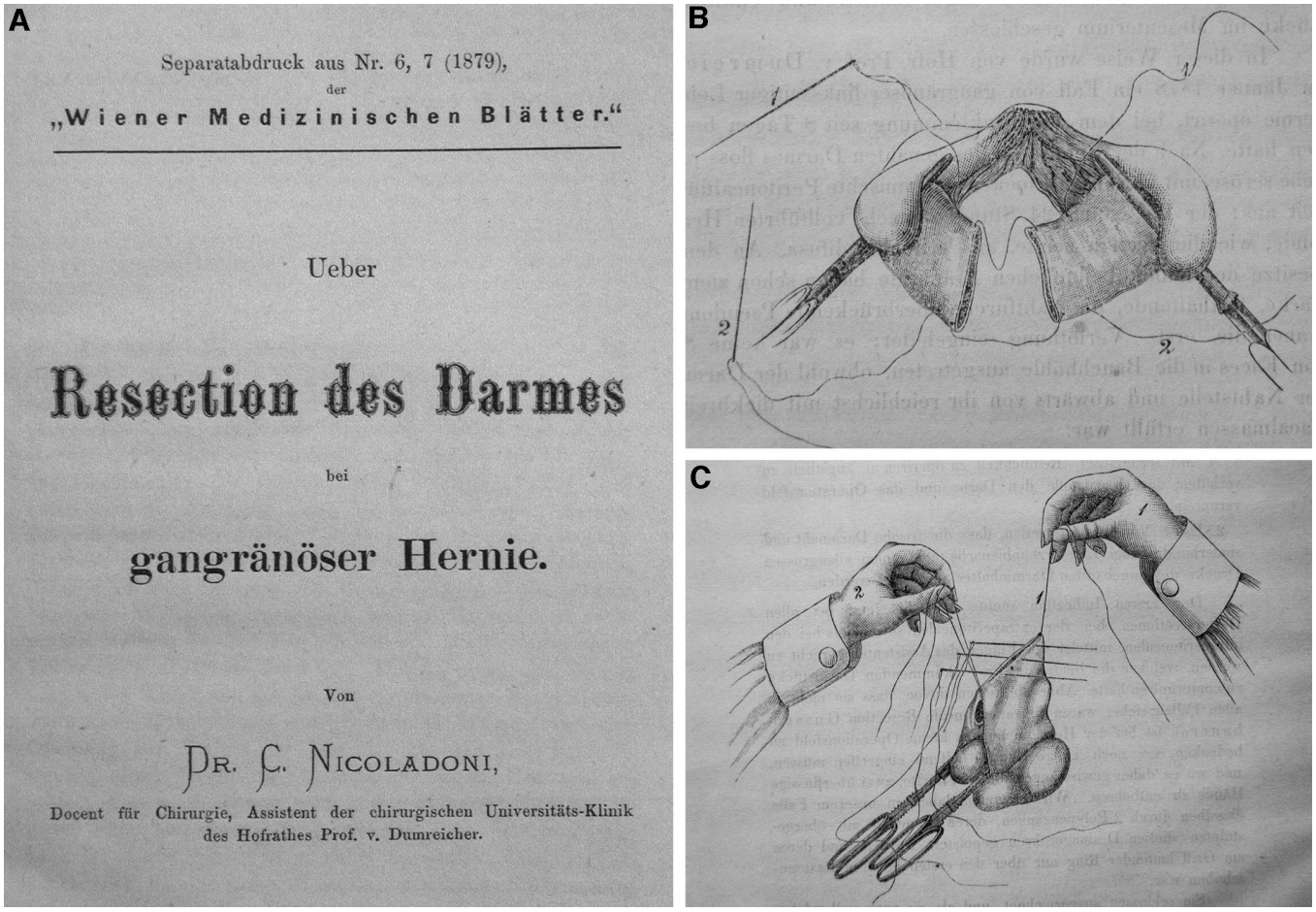

FIGURE 6. (A) The title page of Nicoladoni's paper on the resection of bowel in gangrenous hernia, published in Wiener Medizinische Blätter, 1879. (B) and (C) Demonstration of bowel anastomosis after resection of gangrenous hernia in the same paper. (Note the use of 2 clamps to avoid contamination of the surgical field with the bowel content).

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in Billroth's clinic. According to Schönbauer, a medical historian,[51] Nicoladoni was also the creator of numerous operations in the field of gastrointestinal surgery, despite the excellent role of Billroth in this field.

Analysis of Nicoladoni's scientific papers demonstrated that he was also a competent surgeon in the field of general surgery as it is known today. He performed a variety of operations including hernia repair,[52–54] rectal prolapsus, and resection of the rectum after carcinoma.[55,56] Nicoladoni was not absolutistic, and paid attention to different opinions when they were objectively justified. In this context, he accepted and practiced the original Bassini technique for treatment of inguinal hernias after it was published in the XL volume of Langenbeck's Archive in 1890, and in less than 4 years (1891–1895), Nicoladoni performed 260 hernia operations with a great success.[54] The long term results ranging from 1 to 4.5 years demonstrated a great success of the repair with no recurrence.

According to Schönbauer, Nicoladoni performed the first bowel resection in an incarcerated gangrenous hernia followed by enteroraphy.[51] Nicoladoni writes on this matter in the following manner: ". . . After herniotomy, blue dark colored hemorrhagic fluid came out. A gray pseudomembrane was covering the gangrenous bowel. After performing debridement, we pulled the bowel out and resected the gangrenous bowel and performed an enteroraphy. . . ." He emphasized the importance of avoidance of contamination with fecal material in the operation field. For this purpose, Nicoladoni used special kinds of bowel clamps, so-called "polypenzange" (polypclamp) covered with elastic rubber to avoid contamination of the field with the bowel content and to avoid excessive pressure on the bowel anastomoses by the bowel content[57] (Fig. 6).

Nicoladoni introduced original ideas for enteroplasty.[58] He was not satisfied with the available techniques of his time regarding the placement of anus preterminalis following resection of large segment of the left colon and the sigmoid colon. One such technique proposed by John Marshall (Marshall J. Clin. Lecture on colectomy. Lancet 1882) and other surgeons of that time, such as Billroth (as referred to by Nicoladoni in his paper) was diversion of the proximal segment to replace anus preterminalis followed by intraperitoneal closure of the distal end. Nicoladoni reported 2 new ideas on enteroplasty; the first idea was to interpose a segment of autologous small bowel by means of 2 bowel anastomoses between the remaining stumps of colon after resection. The second idea for avoiding the artificial new anus was to divide the adjacent small bowel and anastomose the proximal end of the small bowel with the proximal colon stump and the distal one with the distal colon stump (Fig. 7). Unfortunately, Nicoladoni refrained from applying these techniques for unknown reasons.

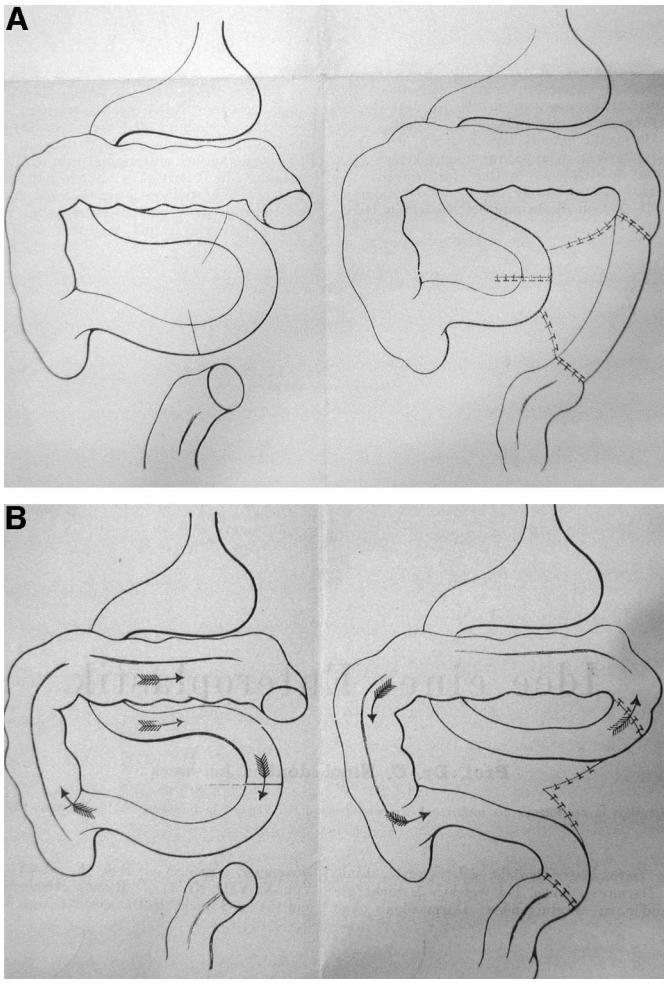

FIGURE 7. Nicoladoni's 2 ideas (A) and (B) for enteroplasty following resection of a segment of large bowel, published in Wiener Medizinische Presse, 1887.

As mentioned previously, Nicoladoni can be regarded as one of the most unique surgeons of his time, with a particular interest in clinical anatomy. Nicoladoni tried to investigate the anatomy of various pathologies by performing autopsies whenever possible and by these means he tried to develop a standard surgical approach and treatment of newly discovered cases. One such example was his interest in the surgical treatment of esophageal diverticulum. He made an extensive literature search and studied 13 cases with esophageal diverticulum reported at that time. He additionally carried out a cadaver study in 3 bodies with esophageal diverticulum, described signs and symptoms of the condition in a considerable detail, and performed operations for its treatment. We quote here his surgical technique: ". . . After putting a probe through the mouth into the diverticulum and evaluating it, the skin incision is made in the anterior border of the sternocleidomastoid muscle on the level where the

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probe indicated the location of the diverticulum. Then, the dissection was carried on and the esophagus was reached by retracting the thyroid gland medially and the omohyoid muscle and vessels to the lateral side. After, the diverticulum was exposed; it was opened at its base. When a catheter can be easily passed from mouth to stomach and the diverticulum is small, it is closed by direct sutures. If not, we make a hole in the skin and suture the diverticular border to the skin and put drainage into it. The drainage is continued until the lumen below the diverticulum is not open. The drainage is removed and the diverticulum is resected at the base and esophagus is closed. . . ."[59,60]

Nicoladoni was one of the first in history to perform en bloc resection of the adrenal gland and the kidney (as written by Nicoladoni in his paper) due to carcinoma. The indication and the technique of the operation were depicted in a very detailed manner. It was reported that although the operation itself was successfully performed with no problems, the patient died 14 hours after the operation for unknown reasons.[61]

Nicoladoni also performed several operations in the field of genitourinary surgery. He describes operations for treatment of female genital tumors,[62] bladder stones,[63,64] and closure of vagina-urethral fistulas.[65] Between 1881 and 1886, Nicoladoni performed 50 laparotomies for resection of a variety of female genital tumors. He carried out 31 ovariectomies for the treatment of several surgical conditions of ovary (18 ovarian tumor cysts, 10 ovarian cystoma, one papilloma of the uterus and the ovary, one spindle cell sarcoma with an ovarian cyst, and one ovarian fibroadenoma) and extirpation of myoma uteri in the remaining 19 cases. It is amazing to note that every single patient had a detailed record including the complications of surgery with an estimated mortality rate of 6.5%.[62]

Nicoladoni, to our knowledge, described for the first time in a considerable detail (as written by himself[66] and his pupil Payr[9]), the entity of "torsion of the spermatic cord" leading to the testicular torsion with the macroscopic alteration of the scrotum and he gave its original operative treatment. However, he misinterpreted cryptorchidism as a cause for spermatic cord torsion. Nicoladoni writes about his technique of "orchidopexy" for the treatment of this rare surgical problem in the following manner: ". . .First I fixed the spermatic cord close to the pulled out inner groin ring, to the posterior wall of the processus vaginalis with a superficially and transversely oriented catgut thread, therewith now the testicle was easily hang in the scrotum in the right orientation, the processus vaginalis testis was split and pulled in the way of a tight vagina over the course of the spermatic cord and anchored to the spermatic cord so that the cord can not twist. . . ."[66]

CONCLUSIONS

Analysis of Nicoladoni's life and surgical career revealed that he significantly contributed to the development of surgery during the nineteenth century. He performed a variety of original operations in several surgical disciplines and published his works in several journals. Although his main contributions were in the field of orthopedic, plastic and reconstructive surgery, he introduced innovative ideas and operations in gastrointestinal surgery and urogenital surgery. Nicoladoni was certainly a pioneer in various surgical endeavors, who was also responsible for the up march of modern surgery during the nineteenth century in Europe. The importance and scientific value of his contributions lay far beyond the boundaries of the nineteenth century and Austria.

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